**Affects on Solutions Lab**

**Teacher to Teacher**

**(suggested 1 day activity)**

**Materials:**

6 cups labeled A-F stopwatch

100 ml beaker bottle of soda water (seltzer water)

3 sugar cubes (4g each) 500 ml beaker

3 granulated sugar packet (4g each) hot water

3 stirring sticks cold water

**Objectives:**

The students will learn the affects of temperature, stirring, and particle size on solid and gas solutions.

**Process:**

The students perform the lab as stated in directions. It is suggested that the class is split up and half the class shares a bottle or two of soda water and then the other half shares additional bottles (this will keep you from buying 12 bottles per class.)

In part A it is important that the sugar packet size and the sugar cube size is the same. Also be sure that the hot water is pretty hot and the cold water is pretty cold. BE SURE THE CUPS CAN HOLD 100ml OF WATER and only be half full.

In part B be sure the students make the observations BEFORE opening the bottle. It is usually good to call the students forward and do this with them. The important part is that they realize before opening the bottle that there is a high pressure in the bottle (squeeze the bottle to feel the pressure) and there are no bubbles visible in the bottle.

Basics of the lab:

Higher temperature means faster dissolving of a solid.

Stirring means faster dissolving of a solid.

Smaller particle size (sugar packet) means faster dissolving of a solid.

Higher temperature means faster undissolving (more bubbles) of gas

Stirring means faster undissolving of a gas

**Grading:**

Answers to questions:

1. Increasing the surface area increases the rate of dissolving for a solid.

2. Increased temperature means increased rate of dissolving for a solid.

3. Increase in temperature means the less the gas can be dissolved.

4. Stirring increases the rate of dissolving for a solid.

5. Stirring decreases the amount of gas that can be dissolved.

**Affects on Solutions Lab**

To make a sugarwater solution you may either use granulated sugar or a sugar cube. If you use the same mass of each, then the one with the greatest surface area will dissolve faster - the granulated sugar. Surface area is one factor that affects the dissolving rate, and other factors are temperature, stirring, and pressure. Also solid solutes are effected by these factors differently than gaseous solutes.

**Equipment:**

6 cups labeled A-F stopwatch

100 ml beaker bottle of soda water (seltzer water)

3 sugar cubes (4g each) 500 ml beaker

3 granulated sugar packet (4g each) hot water

3 stirring sticks cold water

**Procedure:**

**Part A - Solid in Solution**

1. Using the 100 ml beaker, add 100 ml of cold water to cups C, D, E, and F. Add 100 ml of hot water to cups A and B.

2. Add a sugar cube to cups B, D, and F. Add the contents of the sugar packet to cups A, C, and E. Start the time on the stopwatch.

3. Begin stirring cups E and F.

4. When you notice that all the sugar has dissolved in any of the cups, write down the time in the data table. Continue to stir/watch the other cups until all the sugar has dissolved in all the cups. If after ten minutes there is still a cup with undissolved sugar, then stop the time and record a time of 10 minutes for those cups.

5. Rate the solutions from 1 to 6 in terms of how quickly the sugar dissolved. 1 is the fastest rate and 6 is the slowest. If you have more than one that lasted 10 minutes, then rate those solutions by how much ended up dissolving.

**Part B - Gas in Solution**

1. Empty and rinse out all the cups. Return cups D, E, and F to the lab station. Keep cups A, B and C.

2. Observe the UNOPENED bottle of soda water. Squeeze the bottle with your fingers and make an observation on how high the pressure is on the inside. *Record your observations about the pressure and the amount of bubbles (escaping gas).*

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3. Open the bottle and make new observations. Be sure to record your observations about what forms inside the bottle when you open it. Squeeze the bottle a little and make a new observation about how high the pressure is on the inside. *Record your observations about the pressure and the amount of bubbles (escaping gas).*

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4. Pour about 200 ml of hot water into the 500 ml beaker. Pour 50 ml of soda water into each cup A, B, and C. Cup A is your control.

5. Place cup C into the beaker with the hot water and let it float there. Stir the soda water in cup B. Rate each cup based on how quickly the bubbles left the solution. 1 is the quickest and 3 is the slowest.

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**Clean Up:**

Rinse out all the cups, throw away the stirring sticks, and return the cups to the lab station.

**Questions:**

**Please use complete sentences.**

1. The sugar in the packet has a greater surface area than the sugar cube. How does increasing the surface area affect the dissolving rate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. How did temperature affect the dissolving rate of the sugar in solution?

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3. In part B as the bubbles disappear the gas is leaving the solution. This is the opposite of dissolving. How did temperature affect the dissolving rate of the gas in solution?

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4. How did stirring affect the dissolving rate of the sugar in solution?

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5. How did stirring affect the dissolving rate of the gas in solution?

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